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Immunogenicity and allergenicity of camel and cow's milk: a comparative study in brown Norway rats

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Background

The most common food allergy in infants and children is cow's milk allergy (CMA). When breastfeeding is impossible or insufficient, the use of cow's milk based hypoallergenic infant formulas is an alternative for infants suffering from or in risk of developing CMA. However, they are poor in flavour, thus some children may refuse them. As *Camelus dromedaries* (*Camelidae* family) has a large evolutionary distance to the *Bovidae* family and as camel milk differs from cow's milk protein composition, there is a growing interest in investigating the suitability of camel milk as an alternative to cow's milk based hypoallergenic infant formulas.

Method

The aim of the project was to compare the immunogenicity and allergenicity of camel and cow's milk as well as investigating their cross-reactivity using a Brown Norway rat model. Rats were kept on a diet free from milk for more than 10 generations and immunised i.p. three times with one of four products: camel milk, cow's milk or the whey or casein fraction of cow's milk. Immunogenicity, sensitising capacity, antibody avidity and cross-reactivity were evaluated by means of different ELISAs. The eliciting capacity was evaluated by an ear swelling test. Immunoblotting was performed to elucidate the specificity of the antibody responses and to evaluate the relative ratio between reactivity towards linear vs. conformational epitopes antibody responses were evaluated against native and denatured milk proteins.

Results

Camel and cow's milk showed similarity in their immunogenicity, sensitising and eliciting capacity. Cross-reactivity was shown to be low between the counterpart proteins in camel and cow's milk. Greater cross-reactivity was seen between the whey proteins compared to caseins. Comparing antibody reactivity against native and denatured proteins showed a predominance of linear epitopes in caseins while in whey proteins there were more conformational epitopes. Antibody avidity did not differ significantly between antibodies raised against camel or cow's milk. Based on inhibitory ELISA, cow's milk was shown to inhibit approx. 50% of antibodies raised against camel milk, whereas camel milk could only inhibit approx. 20% of antibodies raised against cow's milk.

Conclusion

The study showed that camel and cow's milk have a very low cross-reactivity, indicating a low protein similarity. Results showed that camel milk could be a promising alternative to cow's milk based hypoallergenic infant formulas.